SoyaShrestha_77356846_Project Specification_Intial Project Plan(TitleSubmission+RiskRegister).pdf

by Soya Shrestha

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BSc (Hons) Computing Course 2023/24

Level 6 Production Project

Name: Soya Shrestha	**Student I.D.: 77356846**
Course: BSc (Hons) Computing	**Supervisor's Name:**

Final Project Individual Aim & Objectives

Title of my Project:

Smart Vitals: A portable Health Monitoring System

Aim of my Project:

To design and develop a portable health monitoring system that accurately measures users' vital health indicators in real-time, allowing for timely medical interventions when needed.

Objectives of my Project:

1. **Study the implementation of IoT in medical field.**
2. **Develop a basic understanding how portable health devices are revolutionizing health management through real-time health monitoring.**
3. **Explore algorithms for detecting real time health vitals.**
4. **Gain in-depth knowledge of C/C++ programming in embedded systems and integrate these programs with sensors in a portable device to monitor heart rate, SpO_2, blood pressure, and body temperature via OLED display for local access.**

5. **Design and develop a mobile application which will help the registered family member in monitoring the vital signs of the user in real-time.**
6. **Integrate a notification system in the mobile application to alert registered family members or caregivers any time the device detects any abnormal readings.**

Specification of my Product:

Functional and Non-Functional activities with MoSCoW:

Functional Requirement	MoSCow
Device must be portable, lightweight and user-friendly.	**M**
The device must be connected to Wi-Fi for seamless interaction.	**M**
Must be able to measure heart rate, SpO_2, blood pressure and body temperature.	**M**
Must be able to get real-time health measurement through OLED display for quick and local access.	**M**
Should be able to get access to the health readings via mobile application.	**S**
Should send family member or care giver notification if any irregularity in health reading.	**S**
The mobile application could contain contact information of family doctor or emergency numbers for quick access in urgent situations.	**C**

Non-Functional Requirement	MoSCow
The readings for heart rate, SpO_2, body temperature and blood pressure on the system must be accurate.	**M**
The device must display all the measurements instantly within few seconds.	**M**
The mobile app must show all the readings with necessary charts.	**M**
The battery on the device should operate for at least 2 to 3 days.	**S**
The device could support additional sensors for future works.	**C**

Research:

One of the most researched areas in medical science is the application of IOT-based health monitoring system (Shaown, et al., 2019). Personal Healthcare Devices (PHD) are portable healthcare devices that measures user's vital signals. Using IoT devices for health monitoring systems has become an essential part for remote healthcare as it is user friendly, lightweight and cost effective (Woo, et al., 2018). The system uses embedded technology and different sensors to gather real-time data of user including, ECG, body temperature, SpO_2, and Blood Pressure and shows the readings on the OLED display or is transmitted over Wi-Fi to a mobile application (Raja, et al., 2024). The end goal is to provide users with a cost effective and reliable healthcare device. By providing real-time insights of vital signs this system allows for timely interventions when necessary (Abdulmalek , et al., 2022).

Evaluation:

To successfully complete the project, it is essential to meet all the objectives mentioned. For that extensive tests are conducted. Wide range of data will be fed to the device. Resulting output will determine accuracy of the system.

To ensure that all functionality of the system, such as accurate reading of heartbeats, blood pressure, body temperature and oxygen levels and sending real time notification, are met continuous testing will be done. It includes providing a variety of health conditions and sensor inputs to check how the system performs under different scenarios. Depending on the accuracy and precision of the readings, reliability of the system will be determined. A detailed evaluation of hardware and software components will be conducted to determine how well the components work together.

Project Planning & Methodology

Project Planning:

Task Sheet

	Task Mode	Task Name	Duration	Start	Finish	Predecessors
1		**1. Start Project**	**98 days**	**Tue 12/17/24**	**Mon 4/28/25**	
2		**2. Initiation**	**17 days**	**Tue 12/17/24**	**Mon 1/6/25**	
3		2.1 Research on the module	2 days	Tue 12/17/24	Wed 12/18/24	
4		2.2 Research on Project title	5 days	Wed 12/18/24	Tue 12/24/24	
5		2.3 Review of research article	3 days	Thu 12/26/24	Sat 12/28/24	
6		2.4 Finalize Project title	3 days	Mon 12/30/24	Wed 1/1/25	5
7		2.5 Title Submission (Project Specification and Risk Register)	4 days	Thu 1/2/25	Mon 1/6/25	6
8		**3 .Planning**	**10 days**	**Tue 1/7/25**	**Fri 1/17/25**	
9		3.1 Schedule planning by breakingdown the project	4 days	Tue 1/7/25	Fri 1/10/25	
10		3.2 Choose technologies to be used	1 day?	Sat 1/11/25	Sat 1/11/25	9
11		3.3 Identify hardware and system requirements with their availability and budget allocation	2 days	Mon 1/13/25	Tue 1/14/25	10
12		3.4 Research on necessary tutorials, courses, or guides for tools and technologies to be used	2 days	Wed 1/15/25	Thu 1/16/25	11
13		3.5 Evaluate risks and their potential impacts	1 day	Fri 1/17/25	Fri 1/17/25	
14		**4 Research On project**	**12 days**	**Sat 1/18/25**	**Mon 2/3/25**	
15		4.1 Research on IoT based projects related to my project	6 days	Sun 1/5/25	Fri 1/10/25	
16		4.2 Research on relevant articles	3 days	Sun 1/12/25	Tue 1/14/25	
17		4.3 Review different books based on IoT healthcare system	6 days	Wed 1/15/25	Wed 1/22/25	
18		4.4 Understanding the working mechanism of Arduino and sensors involved	8 days	Wed 1/22/25	Fri 1/31/25	
19		4.5 Finalize and Submission of Ethical Consent form	2 days	Sun 2/2/25	Mon 2/3/25	
20		**5. Training and Implementation**	**45 days**	**Tue 2/4/25**	**Mon 4/7/25**	

Task Sheet

21		5.1 Courses and Tutorials on Arduino, Sensors, and Health Monitoring	10 days	Tue 2/4/25	Mon 2/17/25	
22		5.2 Enorll in online classes for flutter and dart	6 days	Mon 2/17/25	Sun 2/23/25	
23		5.3 Set up the development environment for C/C++	1 day?	Mon 2/24/25	Mon 2/24/25	
24		5.4 Commence writing and implementing the project's code	8 days	Tue 2/25/25	Thu 3/6/25	
25		5.5 Initial testing of Sensor integration with ESP32	2 days	Fri 3/7/25	Sun 3/9/25	
26		5.6 Integrating custom algorithms and code with the Arduino platform for seamless functionality	8 days	Mon 3/10/25	Wed 3/19/25	
27		5.7 Finalize Work In Progress with presentation	3 days	Thu 3/20/25	Mon 3/24/25	
28		5.8 Integrating notification system	2 days	Tue 3/25/25	Wed 3/26/25	
29		5.9 Develop Mobile Application using flutter	8 days	Wed 3/26/25	Fri 4/4/25	
30		5.10 Test overall system functionality and correct any integration issues	2 days	Sun 4/6/25	Mon 4/7/25	
31		**6. Testing and Evaluating**	**9 days**	**Tue 4/8/25**	**Fri 4/18/25**	
32		6.1 System Integration Testing	4 days	Tue 4/8/25	Fri 4/11/25	
33		6.2 Functional Testing	3 days	Sun 4/13/25	Tue 4/15/25	
34		6.3 Performance Testing	3 days	Wed 4/16/25	Fri 4/18/25	
35		**7. Closing**	**6 days**	**Mon 4/21/25**	**Mon 4/28/25**	
36		7.1 Final Product Submission and Presentation	1 day	Mon 4/21/25	Mon 4/21/25	
37		7.2 Final Demonstration	1 day	Mon 4/21/25	Mon 4/21/25	36
38		7.3 Final Report Submission	1 day	Mon 4/28/25	Mon 4/28/25	

Fig 1: Task sheet of the project

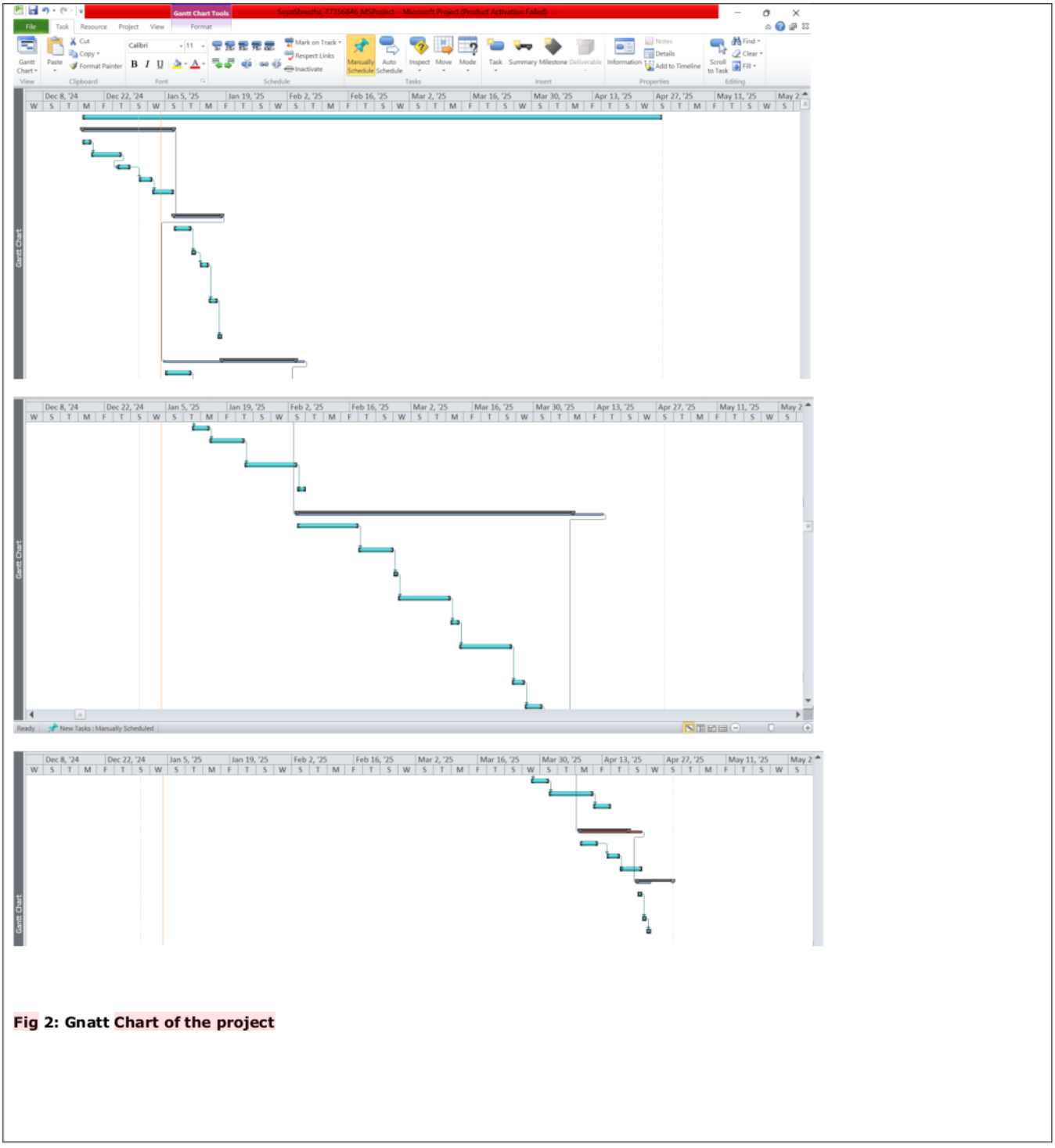

Fig 2: Gnatt Chart of the project

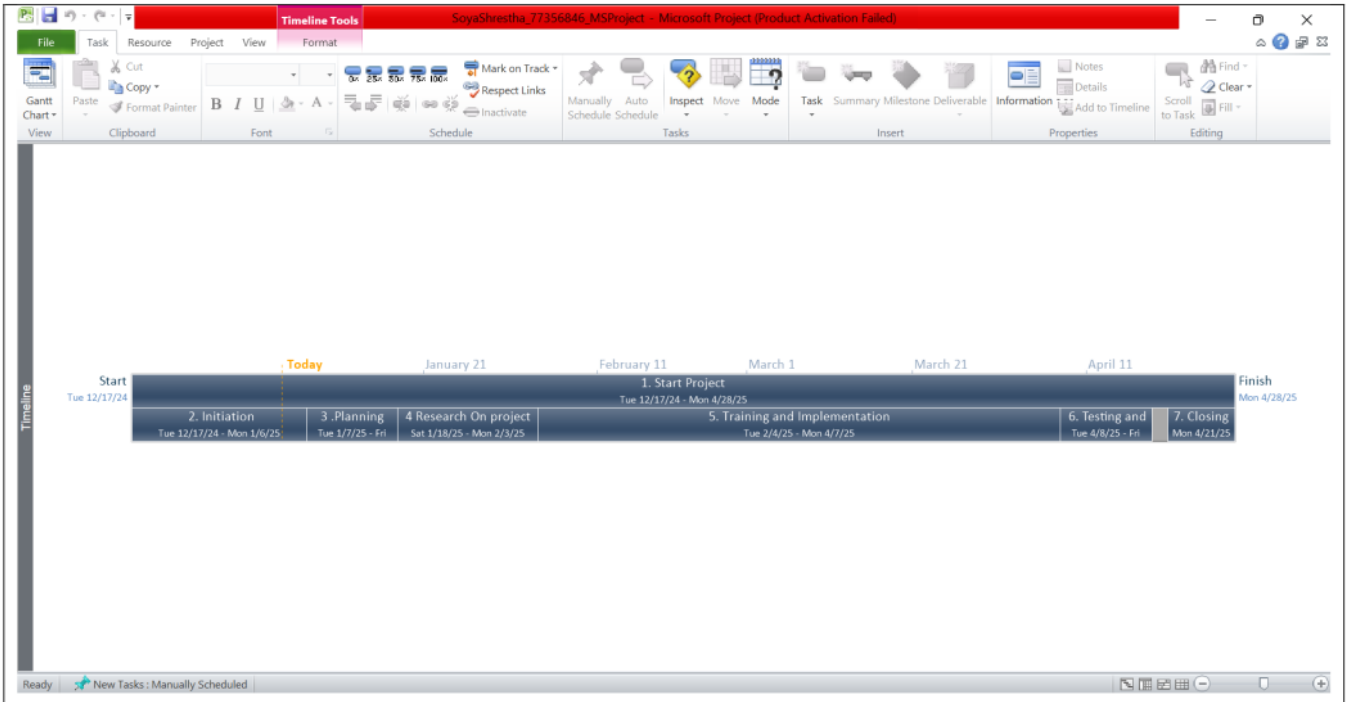

Fig 3: Timeline of the project

Methodology:

SpO_2 sensors, EGC sensors, temperature sensors, and Arduino board, were selected based on their performance and precision (Michaluk, 2021). The sensors were embedded in Arduino and evaluated for different measurements, for real-time access including OLED display with graphics.

Real time health readings were provided to the caregivers through a flutter-based mobile application whenever any irregularities are detected. It also provides data security through an encrypted communication system ensuring the users' privacy (Giesbrecht, 2022). The sensors' reliability and precision would be validated by contrasting the readings with the medical devices. The project would implement Agile methodology, by dividing the development process into iterative phases, focusing on particular milestones, including sensor configuration and mobile app development. In order to track the progress, Gnatt chart and Timeline would be used.

Resources

The hardware and software I require to complete my Project successfully:

Hardware:

1. Laptop
2. Esp32 type S
3. SpO_2 Sensor (MAX30100)
4. ECG Sensor
5. 3D printed box
6. Temperature Sensor
7. Matrix Board
8. Male / Female Header
9. Jumper wire
10. OLED Display

Software:

1. Programming Language (C / C++)
2. Code Editor / IDE (VS Code, Arduino IDE)
3. Operating System (Windows)
4. Flutter
5. Dart
6. Microsoft Word
7. Microsoft Project
8. GitHub

Human Resource

I am working on my Project with the following people

Name:	Role:

	Module Leader Supervisor

Initial Bibliography

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Woo, M. W., Lee, J. W. & Park, K. H., 2018. A reliable IoT system for Personal Healthcare Devices. *Future Generation Computer Systems,* Volume 78, pp. 626-640.

Risk Register

ID	Risk	Risk Description	Likelihood	Impact	Severity	Owner	Mitigation	Status
1	Battery Life Issues	Issues with the battery such as failure and short battery life.	Medium	Low	Medium	Self	Use of long-lasting batteries, always turning off the device when not in use.	Open
2	Connectivity Issues	Real-time heath monitoring may become difficult due to poor network connectivity.	Medium	High	High	Self	Make sure there is always a stable internet connection.	Open
3	Device Compatibility	Mobile application and operating system may not be compatible with all mobile devices.	High	Medium	Low	Self	Ensure that the device is compatible through various platform.	Open
4	Hardware Failure	Hardware failure such as sensors disconnection, display failure, etc. is possible.	Low	Medium	High	Self	Use of hardware that are of high quality, with constant testing.	Open
5	Sensor Malfunction	Occurrence of sensor malfunction leading to inaccurate readings.	Medium	High	High	Self	Consistent calibration of sensors and thorough testing in various conditions before deployment.	Open
6	Mobile Application Bugs	Slow performance, application crash and error in display, affecting the applications' functionalities.	Low	Medium	Medium	Self	Continuous testing with real users, and extensive debugging during the time of app development.	Open
7	Software Bugs	System crash, inaccurate readings, failure in data synchronization due to software bugs.	High	Medium	High	Self	Testing in early phases to identify bugs beforehand and system-integration testing.	Open

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